Emissions Calculations for Combustion

Andrew Deal - Air Quality Division

Mecklenburg County Land Use and Environmental Services Agency

Combustion Sources

Typical Combustion Sources:

- Engines
- Boilers
- Process Heaters (i.e. Asphalt Drum Mixer)





Typically you need:

- Hours of operation
- Fuel Usage (gallons, cubic feet, etc.)
- Fuel Type (natural gas, #2 fuel oil, etc.)
- Emission factors (i.e. AP-42, source tests)



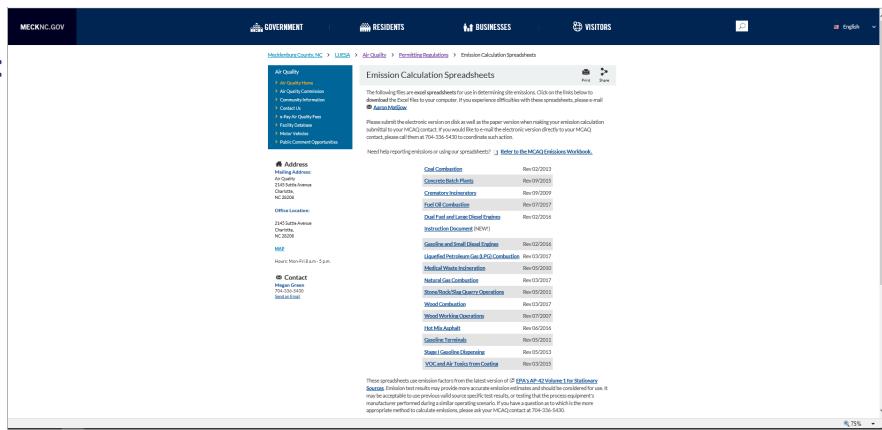


Let's get started

Example:

Source:	1500 kW (2000 hp) emergency generator	9 mmBtu/hr boiler
Run hours	55 hours of operation	6,800 hours of operation
Fuel usage And type	3,025 gallons combusted (#2 fuel oil)	60,000,000 cf of natural gas

We have spreadsheets:





1500 kW (2000 hp) Generator: Address
Mailing Address:
Air Quality
2145 Suttle Avenue
Charlotte,
NC 28208

Office Location:

2145 Suttle Avenue Charlotte, NC 28208

MAP

Hours: Mon-Fri 8 a.m - 5 p.m.

Megan Green 704-336-5430 Send an Email Need help reporting emissions or using our spreadsheets?

Refer to the MCAQ Emissions Workbook.

<u>Coal Combustion</u>	Rev 02/2013
Concrete Batch Plants	Rev 09/2015
Crematory Incinerators	Rev 09/2009
Fuel Oil Combustion	Rev 07/2017
<u>Dual Fuel and Large Diesel Engines</u>	Rev 02/2016
Instruction Document (NEW!)	
Gasoline and Small Diesel Engines	Rev 02/2016
Liquefied Petroleum Gas (LPG) Combustion	Rev 03/2017
Medical Waste Incineration	Rev 05/2010
Natural Gas Combustion	Rev 03/2017
Stone/Rock/Slag Quarry Operations	Rev 05/2011
Wood Combustion	Rev 03/2017
Wood Working Operations	Rev 07/2007
Hot Mix Asphalt	Rev 06/2016
Gasoline Terminals	Rev 05/2011
Stage I Gasoline Dispensing	Rev 05/2013
VOC and Air Toxics from Coating	Rev 03/2015

These spreadsheets use emission factors from the latest version of P EPA's AP-42 Volume 1 for Stationary



9 mmBtu Boiler: Need help reporting emissions or using our spreadsheets?

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1500 kW Generator:

Large Diesel and All Dual-Fuel Engines Emissions Calculator Feb 26, 2016 Revision

Instructions: Please provide the information shown in blue below. The applicability of this spreadsheet is limited to diesel engines larger than 600 hp and all dual-fuel (diesel/natural gas) engines. Please note that, when used in conjunction with permit applications, any value entered for annual operations of these engines may become a permit limit.

For annual emissions enter either (1) Engine Output (hp) and Annual Operation (hours) or (2) Generator Output (kW) and Annual Operation (hours).

User Input		This section can be used to calculate kW-hr output	
Company Name:	Hot ICE Company	from hours of operation and engine hp output.	
Plant County:	Mecklenburg	This can be useful for operators with hour meters but	
Plant City:	Charlotte	no Watt-hour meters. It assumes full load operation	
Permit Number:	NA	resulting in conservative emission estimates.	
User:	V. Hot		
Diesel Fuel Sulfur Content (%):	0.5000	Annual Operation (hours):	500
NG Fuel Sulfur Content (gr/mm cu ft):	0		
Engine Output (hp):	0	Generator Output (kW):	750
Annual Electrical Output (kW-hr):	375,000	Annual Output (kW-hr):	375,000
Annual Output (hp-hr):	571,458		

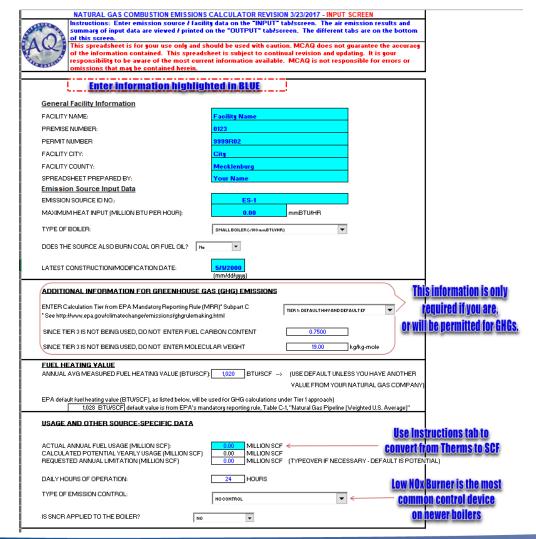
DISCLAIMER: This spreadsheet is for your use only and should be used with caution. MCAQ does not guarantee the accuracy of the information contained. This spreadsheet is subject to continual revision and updating. It is your responsibility to be aware of the most current information available. MCAQ is not responsible for errors or omissions that may be contained herein.

Emissions Output for Diesel Engines				Emission	Factor
Criteria Pollutants				Factor	Quality
Pollutant	lb/hr	lb/yr	tpy	lb/hp-hr	Rating
PM	0.80	400.02	0.20	7.00E-04	В
PM-10	0.80	400.02	0.20	7.00E-04	В
PM-2.5	0.80	400.02	0.20	7.00E-04	В
NO _x , uncont.	27.43	13,715.00	6.86	2.40E-02	В
NO _x , cont.	14.86	7,428.96	3.71	1.30E-02	В
TOC (as CH ₄)	0.81	402.88	0.20	7.05E-04	С
NMTOC	0.73	366.62	0.18	6.42E-04	Е
CO	6.29	3,143.02	1.57	5.50E-03	С
SO _x	4.62	2,311.55	1.16	4.05E-03	В
Total HAP	1.40E-02	7.01	0.004	1.23E-05	
Largest HAP (benzene)	6.21E-03	3.10	0.002	5.43E-06	

Emissions Output for Dual-fuel Engines Criteria Pollutants				Emission Factor	Factor Quality
Pollutant	lb/hr	lb/yr	tpy	(lb/hp-hr)	Rating
PM	NA	NA	NA	ND	NA
PM-10	NA	NA	NA	ND	NA
PM-2.5	NA	NA	NA	ND	NA
NO _x , uncont.	20.57	10,286.25	5.14	1.80E-02	D
NO _x , cont.	NA	NA	NA	ND	NA
TOC (as CH ₄)	6.05	3,023.01	1.51	5.29E-03	D
NMTOC	1.51	754.32	0.38	1.32E-03	E
CO	8.57	4,285.94	2.14	7.50E-03	D
SO _x	0.23	116.01	0.06	2.03E-04	В



9 MMBtu/hr Boiler:





Print the output tabs and your done!

Almost

We need the reporting form





Emissions Form:

Calendar Year 2018 Annual Emission Report

Facility Name: The Generator and Boiler Place Current Permit Number: 18-001-000

- A facility-wide annual emissions report is due for each Mecklenburg County facility that has a currently active permit
 with Mecklenburg County Air Quality. This report is due by April 30 for the previous calendar year.
- The report shall include all supporting documentation, including emission rate, product usage, operating hours, and all
 relevant information for emission calculations.
- Use the summary table on the following page to summarize emissions from each emission source or insignificant
 activity for which you are required to report. You may also create your own summary page for the annual emissions
 from your facility instead of using MCAQ's annual emission summary table.

What do I need to report?		Where do I find what <u>information</u> I need to report?	
1.	Emissions emanating from all emission sources listed in the facility's current air quality permit	In your facility's air permit, look at the last permit condition. It will contain the reporting requirements for all emission sources at your facility.	
2.	Emissions emanating from any insignificant activities that have reporting requirements	In Appendix B, look at the recordkeeping/reporting column in the insignificant activities table. If there are reporting requirements for any insignificant activities at your facility, they will be specified here.	

The undersigned certifies that all information and statements provided on this annual emission report, based on information and belief formed after reasonable inquiry, are true, accurate, and complete.

Signature of Responsible Company Representative

Printed Name

Date

Return the completed form to: Mecklenburg County Air Quality 2145 Suttle Avenue Charlotte, NC 28208-5237 (704) 336-5430 Fax (704) 336-4391

MCAQ Annual Emission Reporting Form

Pg. 1 Rev. 12/15

(ID OLIVERY)

The summary (I recommend excel):

Example Summary			
CY 2018	Generator:	Boiler:	Total:
	(fuel use)	tpy	tpy
Pollutant	tpy		
PM	0.0424	0.0201	0.0624
PM-10	0.0424	0.0201	0.0624
PM-2.5	0.0424	0.0166	0.0590
NO _x , uncont.	1.3552	3.0000	4.3552
NO _{x′} cont.	0.8047	3.0000	3.8047
TOC (as CH ₄)	0.0381	0.1650	0.2031
NMTOC	0.0347	0.1650	0.1997
СО	0.3600	0.3600	0.7200
SO _x	0.2139	0.0180	0.2319
Total HAP	0.0007	0.0565	0.0572
Benzene	0.0003	0.0001	0.0004
Hexane	-	0.0540	0.0540



Qhastions?

Andrew.Deal@MecklenburgCountyNC.gov

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